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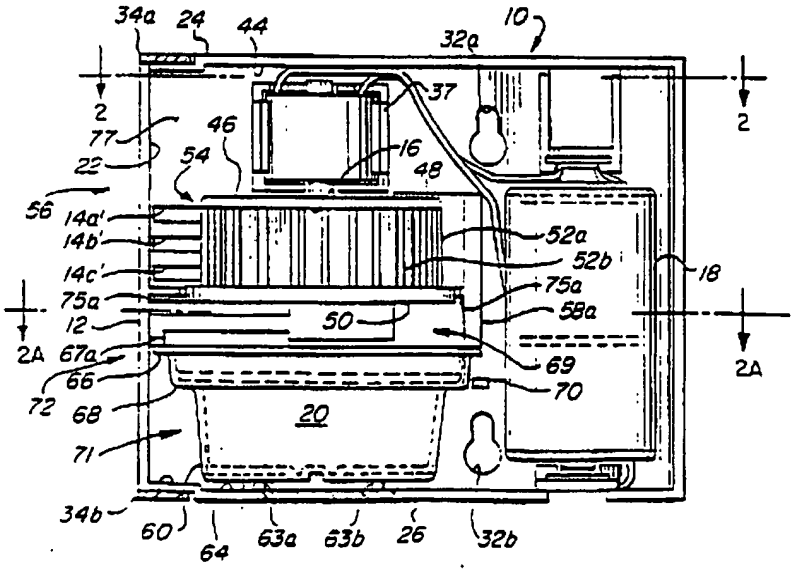

(57) Abstract

A dispenser (10) having a housing (12) and at least one inlet vent and at least one outlet vent (14a-14e') about the housing. A cartridge (20) containing a vaporizable substance is located adjacent the inlet vent. A fan (16) pulls air in the inlet vent, at least partially across the cartridge, upward through a portion of the housing, and radially outward through the outlet vent. A rim (66) of the cartridge and a shelf (67a) inside the housing and adjacent the rim are adapted to form substantially a boundary between a lower (71) and a middle (69) compartment in the housing. The shelf and the rim cooperate to prevent air from circulating below the shelf and entering the lower compartment. At least one upper rib (75a) and a housing (46) of the fan are adapted to form a boundary between the middle compartment and an upper compartment.

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"VAPORIZER"

TECHNICAL FIELD

The present invention relates to devices for inducing air flow past a cartridge containing a vaporizable substance, such as a fragrant oil or gel, wherein the substance is released into the atmosphere to, for instance, overcome undesirable odors typically associated with public washrooms and the like.

It is known to provide a self-contained air freshener having a housing containing a battery-operated fan which blows air directly onto a cartridge containing a pleasant smelling oil or gel. The fan vaporizes the oil or gel into the surrounding atmosphere creating a desirable smell in the room. See U.S. Patent No. 5,230,867 to Kunze et al., U.S. Patent No. 5,147,582 to Holzner, Sr. et al., U.S. Patent No. 4,865,816 to Walz et al., U.S. Patent No. 4,840,770 to Walz et al., U.S. Patent No. 4,830,791 to Muderlak et al., U.S. Patent No. 4,743,406 to Steiner et al., U.S. Patent No. 4,666.638 to Baker et al., U.S. Patent No. 3,993,444 to Brown, U.S. Patent No. 4,370,30 to Mori et al., U.S. Patent No. 4,271,092 to Sullivan et al., U.S. Patent No. 4,166,087 to Cline et al., U.S. Patent No. 4,065,261 to Fukada, and U.S. Patent No. 3,990,848 to Corris.

One problem typically associated with these air fresheners is minimizing the size of the housing while maximizing the air flow past the cartridge containing the oil or gel, while still generating an effective odor for a relatively long period of time. Having a small housing is highly desirable, since a large housing is considered unsightly, yet having a smaller housing can compromise operation effectiveness. For example, a fan which blows air directly down onto the cartridge causes so much air to flow past the cartridge and the oil or gel that the

oil or gel evaporates before it can be vaporized and generally requires a larger housing to place a sufficient distance between the fan and the cartridge. In addition, the rate of vaporization may be unacceptably high. As such, much oil or gel is wasted and the cartridge becomes empty long before the battery life has expired.

In order to reduce the amount of oil or gel which is vaporized, the fan must generally be moved farther from the oil or gel. While this reduces the amount of oil or gel which is evaporated and also reduces the rate of vaporization, the housing size must be enlarged to increase the distance between the fan and the cartridge.

Other drawbacks are associated with known air fresheners. For example, some air fresheners do not provide a clear path for air flow between the oil containing cartridge and the fan. Some do not maximize the amount of air flow over the cartridge, because the fan is turned on its side due to housing dimensional constaints. Others provide vents which are not adjacent to the fan or the cartridge, thus the deodorizing fragrance is sometimes lost or dissipated inside the housing. These known dispensers and others also undesirably allow the air containing the vaporized substance to flow into portions of the dispenser where the air can become trapped and the deodorizing effect is thus minimized.

Known dispensers have another drawback. Typically, dispensers are designed such that the cartridge life and the battery life expire simultaneously, requiring the simultaneous replacement of both units. Because the cartridge housing and the battery are unattached, one must remove one unit (such as the cartridge housing) and sequentially remove the other unit (such as the battery). These required sequential steps can be difficult and time consuming, especially if the dispenser is mounted in a hard-to-reach location, such as high up on a restroom wall.

The containers housed in the dispenser, which contain the fragrant agent, also have drawbacks associated with them. The agent itself can be a messy substance, especially in its liquid form. It therefore requires the exercise of considerable caution to avoid spillage or other mishaps. In addition, the aromatic agent in these dispensers evaporates quickly, so that large containers, and hence cumbersome housings, are required if the supply is to last for any significant period of time.

To meet the demand for a compact, easily handled product, fragrance cartridges were developed. The cartridges use pads treated with an odoriferous agent and mounted in a housing of convenient size, or gels having the odoriferous agent incorporated therein, the gels then being salified in a housing. Like the aromatic agent containers, cartridges are made for a single usage, after which they are discarded.

What is desired, therefor, is a dispenser which is relatively small, which maximizes air flow by providing a plurality of vents which are located adjacent to the fan and the cartridge, which does not force air directly down onto the cartridge, which prohibits the undesirable flow of air by use of a compartment, or chamber, which channels air only into desirable dispenser portions, which provides a clear path for air flow out of the housing to maximize the deodorizing effect, and which has a battery compartment connected to the cartridge. A cartridge is also desired therefor, which contains an aromatic agent that can be dispensed over a relatively long period of time, and which releases an aroma at a suitable rate.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a vaporizable substance dispenser which is reduced in size when compared to conventional

dispensers, but which does not cause the vaporizable substance to evaporate so quickly as to be uneconomical.

It is another object of the invention to provide a vaporizable substance dispenser which pulls air upward from a cartridge, rather than directly onto the cartridge.

It is yet another object of the present invention to provide a vaporizable substance dispenser which has an unobstructed path of air flow and which maximizes the air flowing past the cartridge.

It is still a further object of the invention to provide a vaporizable substance dispenser which has at least one chamber substantially adjacent to a fan, vents, and the cartridge, the chamber having boundaries so as to impede undesirable air flow.

It is another object of the invention to provide a convenient cartridge-type air freshener that has a long life and which releases an aroma at a suitable rate.

To overcome the deficiencies of the prior art and to achieve the objects and advantages listed above, Applicant discloses, in a preferred embodiment, a dispenser having a housing containing at least one inlet vent and at least one outlet vent, a fan operated by a battery for directing air into and out of the vents, and a cartridge, containing a vaporizable substance, which is vaporized by the airflow generated by the fan and directed into the atmosphere through the outlet vents. Due to the arrangement of the fan, vents, and cartridge, air flow is generally through a chamber which is bounded partially by a fan housing and a cartridge rim.

In the preferred embodiment, there are a plurality of parallel and adjacent inlet and outlet vents. Most preferably, in order to maximize dispersal of the vaporizable substance, the vents extend approximately one hundred ninety degrees to two hundred thirty degrees about the perimeter of the housing. The lowermost vents are generally the inlet vents, while the uppermost vents are generally the outlet vents. In the preferred embodiment, the rim of the cartridge is located adjacent the inlet vents. The fan is located adjacent to the outlet vents.

Preferably, the rim of the cartridge and a shelf inside the housing and adjacent the rim are adapted to form a boundary between the middle and a lower compartment in the housing. Another shelf, or radial rib, extends outward from an inner wall of the housing adjacent the fan housing to form a boundary between the middle and an upper compartment. As such, three compartments, or cylindrical chambers, are formed wherein the middle compartment is adjacent the inlet vents. The shelf and the rim cooperate to prevent air from circulating below the shelf and entering the lower compartment. The upper rim cooperates with a housing of the fan to prevent the air from entering the upper compartment, except through the fan housing.

Preferably, a shield or a wall separates the fan from the battery such that the vaporized substance does not undesirably interfere with the electrical operation of the battery, nor is the substance wasted by being directed into the battery compartment.

The fan, which is most preferably a centrifugal fan, pulls air in the inlet vents, at least partially across the cartridge, upward through a portion of the housing, and radially outward through the outlet vents. As such, air flow is generally confined to the middle and upper chambers.

CARTRIDGE HAVING A PAD AND MEMBRANE

In one embodiment of the present invention, the cartridge to be employed in the inventive dispenser is one having a polyester pad sealed within the cartridge housing by a polyester membrane. The properties of the pad and the membrane, including density, denier, and permeability, are selected to provide a desired fragrance release rate and cartridge life. Generally, the pad can have a density of between about 50 and 150 oz/yd^2 and a denier of between about 1.5 and 9. The membrane generally has a denier of between about 4 and 4.5, a density of between about 1.5 and 9 oz/yd^2 and an air permeability of between about 100 and 400 cubic feet per minute (CFM)/ft^2. The combination of these components allows the cartridge to provide a release rate of fragrance of about 0.55 to 0.9 grams per day. For optimum results, a release rate of 0.6 to 0.8 gram per day is provided.

Preferred embodiments of the pad and membrane provide an effective fragrance release rate over a cartridge life of at least 20 and preferably about 28 to 30 days or longer, if desired. One of these embodiments employs a pad having a density of about 120-135, and most preferably 128 oz/yd^2 and a denier of about 6, in combination with a membrane having a density of about 2.9 to 3 and most preferably 2.95 oz/yd^2, a permeability of about 250 CFM/ft^2, and a denier of about 4.4.

Another of these embodiments uses a pad having a density of about 65-80 and most preferably 72 oz/yd^2 and a denier of about 3, and a membrane having a density of about 6 oz/yd^2, a permeability of about 150 CFM/ft^2 and a denier of about 4.4.

CARTRIDGE HAVING A HOT OR COLD TYPE GEL AND MEMBRANE

In another preferred embodiment of the invention, either a hot-type or a cold-type gel can be housed in the cartridge instead of the pad described above. The composition of each gel varies depending upon the desired release rate and the permeability of the membrane which covers the cartridge opening. For an effective release rate of about twenty-five to about thirty days, a suitable hot-type gel may comprise at least about fifty percent fragrant agent, at least about fifteen percent gelling agent, at least about three percent encapsulant and, if necessary, a solvent therefor.

Most preferably, the hot-type gel has a release rate of approximately twenty-eight to about thirty days and comprises at least about seventy-two percent fragrance agent, at least about twenty-five percent gelling agent, at least about five percent encapsulant, and if necessary, a solvent therefor.

Any fragrant agent which provides a suitably strong odor for a sufficiently long time will suffice. Advantageously, the agent is an organic oil-based perfume. One suitable oil-based perfume is commercially available as #220-677 Cherry, manufactured by AromaTech of Somerville, N.J. Other suitable perfumes include, but are not limited to, those commercially available as HF-F-91-8432 Cherry, manufactured by Hogan Fragrances of New York, New York, and #48-549 Cherry, manufactured by Carrubba, Inc., of Milford, Connecticut.

The gelling agent is any heat-activated agent which sufficiently solidifies, thickens, hardens or otherwise firms the gel such that it does not seep or otherwise exit through any attached membrane during use or shipping. Typical gelling agents include various commercially available gums and gels. One suitable gelling agent is available as Aromagel made by AromaTech.

The encapsulant employed protects the fragrant agent from degradation by heat or other processing steps. The encapsulant most often forms a "capsule" surrounding the fragrant agent sufficiently to prevent degradation, yet still allows dispersal of the agent through the gel and to the environment. A suitable encapsulant is one in which the fragrant agent becomes suitably suspended in a liquified and solidified matrix, such that the encapsulant acts as a semipermeable membrane permitting the release of an enclosed fragrance agent. Suitable encapsulants include gelatin and albumin. Others are polymeric in nature although other materials such as buckminsterfullerenes ("bucky balls") can be employed. Suitable materials are commercially available.

A solvent in which the components of the gel are at least partially solubilized is employed, if necessary. Typical solvents include water and alcohols and mixtures thereof.

The composition of the cold-type gel, to achieve a release rate of about twenty-five to about thirty days, may comprise at least about seventy percent fragrant agent, at least about five percent gelling agent and, if necessary, a solvent therefor. Most preferably, to achieve a release rate of about twenty-eight to about thirty days, the cold-type gel comprises at least about eighty-eight percent fragrant agent, at least about ten percent gelling agent, and, if necessary, a solvent therefore.

As was the case with the hot-type gel, any suitable fragrant agent, which provides a sufficiently strong fragrance for a sufficiently long period of time will suffice. Advantageously, the agent is also an organic oil-based perfume, such as #A1177 Citrus, made by Carrubba Inc. Other suitable fragrant agents include those commercially available as #221-571 Citrus made by Aromatech and #HF-F91-8434 Citrus made by Hogan Fragrances.

The gelling agent can be any agent which sufficiently solidifies, thickens, hardens or otherwise firms the gel composition, with or without the application of heat such that it does not seep or otherwise exit through any attached membrane during use or shipping. A preferred gelling agent includes a carboxymethylcellulose, such as Cab-O-Sil made by Cabot Corp. located in Tuscola, Illinois.

Any solvent may be used, if necessary, in which the components of the fragrant agent are at least partially solubilized. Suitable solvents include water and alcohols.

Depending on cost and scent strength, it may be appropriate to mix the perfume in the gel with an odorless extender to prolong the life of the fragrance. A suitable extender for purposes of the present invention, when aromatic organic oil-based perfumes are used are oils, such as Isopar®, an odorless mineral oil, manufactured by Exxon Company USA of Houston, Texas.

After the gel is housed in the cartridge, an air permeable membrane is positioned above the gel and covers the housing opening, screening the flow of the fragrant agent. Because the different hot-type gels and the cold-type gels evaporate at different rates, different membranes are combined with each gel to adjust the cartridge life, providing the desired release rate. One suitable membrane for the hot-type gel described above, to achieve an effective release rate of about twenty-five to about thirty days, is a membrane having a density of about 0.3 oz/yd^2 to about 0.9 oz/yd^2, a permeability of about 800 CFM/ft^2 to about 1200 CFM/ft^2, and a denier of about 4.0 to about 4.8. Such a membrane is commercially available from Intertech Group, Inc., of Old Hickory, Tennessee, and referred to as REEMAY® 2006. A different membrane, such as a different REEMAY® style, can be used with the cold-type gel to achieve the same release rate. The characteristics of the membrane used are "matched" to those of the

gel, as would be understood from this disclosure, to provide the release rate of the entire system.

In the preferred embodiment, the average effective cartridge life is about twenty-five to about thirty days. As such, the average release rate of each gel, when used with a suitable membrane, is approximately 0.70 grams per day to about 1.30 grams per day. The composition of the gel employed and physical characteristics of the membrane can be combined to provide this desired release rate.

The composition of each gel can be varied to provide a variety of odor strengths, ranging from a relatively strong odor to a relatively mild odor, as desired. For example, to obtain a stronger odor for a lesser period of time, more fragrant agent can be used. To obtain a milder odor for a longer period of time, more gelling agent can be used. In the alternative, a stronger odor can be provided by a more permeable membrane (with concomitant reduction in cartridge life) or a milder odor with a less permeable membrane (with concomitant increase in cartridge life). Combinations of these factors can be employed to provide a wide range of variation.

A seal, typically made of foil, is secured over the opening of the cartridge housing and above the membrane to prevent the release of the fragrance between the time of manufacture and the time of use. A tab on the seal can facilitate opening of the seal. This seal can be used with the pad-filled cartridge, described above, as well as the gel-filled cartridge.

In still another preferred embodiment, a cartridge has an attached battery compartment. In particular, the battery compartment has an opening which is of sufficient size to receive and hold at least a portion of a battery. When the battery is contained in the battery compartment, the battery is less likely to

become dislodged in the housing or disconnected from the battery. Further, when the battery is contained within the battery compartment, the cartridge and the battery can be replaced simultaneously, rather than sequentially, thus saving time and effort.

These and other objects will become more readily apparent when the following description is read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front view of a dispenser in partial cross section housing a cartridge, constructed in accordance with the invention, wherein the dispenser door has been removed for clarity;

FIGURE 2 is a top view, in partial cross section, of the dispenser of FIGURE 1;

FIGURE 2A is a partial cross sectional view of a portion of the dispenser shown in FIGURE 1, taken along line 2A-2A with the cartridge removed for clarity;

FIGURE 2B is a cross-sectional view of the dispenser shown in FIGURE 2, taken along line 2B-2B;

FIGURE 3 is an isometric view of the dispenser shown in FIGURE 1, with the dispenser door attached;

FIGURE 4 is a top view of the dispenser;

FIGURE 5 is a front plan view of the dispenser:

FIGURE 6 is a plan view of an end of the dispenser;

FIGURE 7 is a plan view of the other end of the dispenser;

FIGURE 8 is a rear plan view of the dispenser;

FIGURE 9 is a bottom plan view of the dispenser;

FIGURE 10 is a perspective view of a cartridge having a pad and membrane, constructed in accordance with the present invention, with portions broken away for clarity;

FIGURE 11 is a perspective view of a cartridge having an attached battery compartment, and housing a gel, and membrane, constructed in accordance with the present invention, with portions broken away for clarity; and

FIGURE 12 is a front view in partial cross section of the cartridge and attached battery compartment, shown in FIGURE 11, housed in the dispenser shown in FIGURE 1, wherein the cartridge contains a cold-type gel, constructed in accordance with the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to FIGURES 1-9 in detail, a self-contained vaporizable substance dispenser, constructed in accordance with the present invention, is shown and generally designated by the reference numeral 10. It should be noted that for the sake of clarity all the components and parts of dispenser 10 may not be shown and/or marked in all the drawings. Also, as used in this description, the terms "up", "down", "top", "bottom", etc. refer to dispenser 10 when in the orientation illustrated in FIGURE 1. It will be understood, however, that dispenser 10 may

be in any of various orientations when in use, and, as such, the orientation illustrated in FIGURE 1 is not necessary for operability. Furthermore, as used in this description, the terms "front" and "back" also refer to dispenser 10 when in the orientation illustrated in FIGURE 1, with "front" indicating that portion of dispenser 10 shown in FIGURE 5 and "back" indicating that portion of dispenser 10 shown in FIGURE 8.

Although this description is written in terms of dispensing a fragrant oil or gel, such description is for convenience only. It should be understood that the present dispenser applies to a dispenser for any vaporizable substance.

THE DISPENSER

Dispenser 10 is generally comprised of housing 12 having a plurality of inlet and outlet vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e', fan 16 adjacent the vents, battery 18 for operating fan 16, and fragrance containing cartridge 20 adjacent to the vents and in relation to fan 16, such that fan 16 pulls air in through at least one inlet vent, at least partially across cartridge 20, through housing 12 and radially outward through at least one outlet vent. See FIGURES 1, 2, 2A, 3.

Housing 12 can be made of any suitable material, such as plastic, like low- or high-density polyethylene, polypropylene or medium impact styrene, and can be made by any suitable method such as injection molding. Housing 12 includes an internal chamber 22 (shown in FIGURE 1) defined by top 24 (shown in FIGURE 4), bottom 26 (shown in FIGURE 9), back side 28 (shown in FIGURE 8) and front side 30 (shown in FIGURE 5). Housing 12 can stand freely on bottom surface 26 or can be secured, as desired, to a wall (not shown), or other vertical surfaces by key holes 32a, 32b. See FIGURES 1, 8.

As shown in FIGURE 1, front side 30 (shown in FIGURE 5) of housing 12 can be hinged at, preferably, two pivot points 34a, 34b. As shown in FIGURES 2, 4, front panel 30 is secured to back side 28 to close housing 12 by inserting tab 36 of latch 38 into notch 40.

As shown in FIGURES 2, 3, 4, 9, front side 30 and back side 28 can be designed to have the same or a different housing curvature, as desired. Front side 30 can, as desired, be straight, curved or any other suitable shape that is aesthetically appealing or desirable. Housing 12 may be given different appearances by attaching various different front panels 30 to housing 12 at 34a, 34b. In the drawings, front side 30 and back side 28 have generally the same shape.

As shown in FIGURES 1, 3, 5, 6, housing 12 has at least one inlet vent and at least one outlet vent. Most preferably, housing 12 has a plurality of substantially parallel vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' which extend generally about one end 35 of housing 12. Preferably, vents 14a, 14b, 14c, 14d, 14e extend partially about front side 30, while vents 14a', 14b', 14c', 14d', 14e' extend partially about back side 28. Vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' may extend any length about end 35 of housing 12, however, the length of vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' should advantageously be maximized in order to maximize dispersal of the fragrance outside dispenser 10. Vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' preferably extend all about those portions of housing 12 which do not rest adjacent to a supporting wall and which do not surround battery 18. Preferably, vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' are disposed at least one hundred ninety degrees about housing 12, and preferably about one hundred ninety degrees to two hundred thirty degrees about housing 12. Most preferably, vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e' extend about two hundred ten degrees around the perimeter of housing 12.

Housing 12 has bracket 42, shown in FIGURE 2, which secures motor 37 for operating fan 16 to inner surface of rear wall 28 of housing 12, as shown in FIGURE 1. Any suitable motor can be used, such as the one manufactured and marketed by Mabuchi Motor America Corp. having part number RF-330TK-07800.

Fan 16 is preferably a centrifugal fan because of its ability to draw air into it, and then radially outward, thus permitting fan 16 to be disposed relatively closely to the vaporizable substance while not blowing air directly onto the vaporizable substance. Suitable centrifugal fans are commercially available, such as the one manufactured by Advanced Air, Inc. of Riviera Beach, Florida. As shown in FIGURE 1, fan 16 includes outer squirrel cage housing 46 which has cover 48, bottom rim 50, and vertical supports such as 52a, 52b extending therebetween. Uppermost portion 54 of fan 16 is adjacent uppermost portion 56 of vents 14a, 14b, 14c, 14d, 14e, 14a', 14b', 14c', 14d', 14e'. In the drawings, fan 16 lies substantially beside uppermost vents 14a, 14b, 14c, 14a', 14b', 14c'.

Fan 16 is electrically connected to removable battery 18, which is separated in housing 12 from fan 16 by walls 58a, 58b. See FIGURE 2. Any suitable battery can be used, depending on motor 37 and fan 16, but a one and one-half volt battery, size D, is preferred. Battery 18 is designed to operate fan 16 continuously after being operably connected. Battery 18 and fan 16 could, however, be designed to operate fan 16 intermittently. Battery 18 could also be operated by a timer, or by a photocell, if so desired.

As shown in FIGURE 1, cartridge 20, having housing 60 and a hollow chamber (not shown), rests upon at least two elongated ribs 63a, 63b (also shown in FIGURE 2A) projecting from uppermost surface 64 of bottom panel 26 of housing 12. Any suitable cartridge can be used, such as those commercially available. Cartridge 20 may contain any suitable fragrant substance, which is

commonly known in the art. Suitable cartridges are discussed hereinbelow.

As shown in FIGURE 1, rim 66 of cartridge 20 is complimentarily received by a shelf 67a (shown in FIGURE 2A) projecting from an inner surface of rear panel 28. Another shelf (not shown) preferably projects from an inner surface of front surface 30 of dispenser housing 12 to cooperate with shelf 67a to form a partial seal with rib 66. Preferably, at least two shelves, such as 67a are used, although as many shelves, or ribs, should be used so as to form a desired seal. Rim 66 and shelf 67a cooperate to form a boundary between substantially two compartments, sometimes referred to as a lower and middle cylindrical chamber, 71, 69, respectively, in housing 12. As shown in FIGURES 1, 2B, the middle compartment 69 lies substantially above shelf 67a and adjacent vents 14d, 14e, 14d', 14e'. The lower, or second, compartment 71 lies substantially below shelf 67a. Rim 66 and shelf 67a further cooperate such that air ingressing through inlet vents 14d, 14e, 14d', 14e' is capable of traveling generally towards fan 16, with little ability to travel in any other direction. Shelf 67a is preferably designed such that it contacts rim 66 and forms a seal with rim 66, although any suitable design can be used which substantially prevents or interferes with the flow of air in any direction other than towards fan 16.

At least two upper ribs 75a, 75b (shown in FIGURES 2, 2B) cooperate with a lower portion of fan housing 46 to form substantially a boundary between middle chamber 69 and upper chamber 77 (shown in FIGURES 1, 2B). Ribs 75a, 75b cooperate with housing 46 such that air flowing through middle compartment 69 has little ability to flow into upper chamber 77, except through fan 16. It should be understood that, although two ribs 75a, 75b are shown, many ribs could be used so long as a desirable seal between fan 16 and an inner surface of housing 12 is obtained.

Shelves and ribs projecting inwardly from housing 12 generally define the

boundaries of each compartment or chamber. Lower chamber 71 has upper boundary defined substantially by lower surface of shelf 67a and lower boundary defined generally by upper surface 64 of bottom panel 26. See FIGURES 1, 2, 2A. Middle chamber 69 has lower boundary generally defined by upper surface of shelf 67a and upper boundary defined generally by lower surface of ribs 75a, 75b. See FIGURES 1, 2B. Upper chamber 77 has lower boundary defined generally by upper surface of ribs 75a, 75b and upper boundary defined substantially by lower surface 44 of top panel 24. Each chamber 69, 71, 77 is substantially bounded on one side by end 35 of housing 12 and on the other side by walls 58a, 58b.

Shoulder 68 of cartridge 20 acts cooperatively with stake 70 (shown in FIGURES 1, 2A), protruding from housing 12, to securely position cartridge 20 within housing 12. Shelf 67a also acts to prevent movement of cartridge 20 within housing 12. As such, cartridge 20 has relatively little ability to move freely even when dispenser 10 is disturbed.

Cartridge 20 is disposed within housing 12 under inlet vents 14d, 14e, 14d', 14e' and outlet vents 14a, 14b, 14c, 14a', 14b', 14c'. Rim 66, or uppermost portion of cartridge 20, lies substantially adjacent lowermost portion 72 of vents 14d, 14e, 14d', 14e'. See FIGURE 1.

Cartridge 20 comprises, in one embodiment, a polyester pad 122 and corresponding membrane 124 (shown in FIGURE 10) in cartridge 120, or, in another embodiment, a hot- or cold-type gel 222, 322 and corresponding membrane 224 (shown in FIGURES 11, 12) in cartridge 220, 320, respectively.

It should be understood that any of cartridges 120, 220, 320 can be used in dispenser 10, shown in FIGURE 1.

PAD FOR INSERTION INTO CARTRIDGE HOUSING

Referring to FIGURE 10, cartridge 120 comprises pad 122 and membrane 124. Both pad 122 and membrane 124 are preferably made of a polyester material. The specific material of the pad or membrane, however, is of lesser importance than its physical properties; in particular its density and air permeability properties.

Pad 122 is preferably 0.75 inches thick and about 2 inches in diameter. Membrane 124 is usually between about 10 to 35 mils in thickness. Pad 122 should fit snugly within reservoir 123 of cartridge housing 126 so that evaporation of the aromatic agent occurs from top surface 128 of pad 122 rather than from the sides or bottom of pad 122. This ensures that pad 122 acts as a wick, drawing the agent from the lower part of pad 122 to the top when the agent at the top is released to the environs.

A seal 130 is provided across the top of cartridge housing 126, joined to lip 132, for preventing release of the fragrance between the time of manufacture and the time of use. Seal 130 typically is made of foil, and is securely bonded to lip 132 by heat and pressure bonding. Alternatively, ultrasonic welding or a suitable adhesive may be used to make this bond. Seal 130 includes a tab 134 that can be gripped by the user to remove the seal when the fragrance is to be initially released from the cartridge.

Lip 132 allows seal 130 to be bonded thereto in a position away from pad 122, thereby affording a dry surface for providing a secure, airtight seal.

The rate at which the aromatic agent is drawn to the top surface of the pad 122 will depend on the properties of the pad. If pad 122 is of high density and low porosity, then transmission of the agent to the surface of the pad will be

slow. If pad 122 is of low density and high porosity, then the agent will be carried to the surface of the pad more rapidly.

The properties of the membrane 124 also affect the manner in which the fragrance agent is dispensed, by delimiting the rate of communication between the outside air and the fragrance agent at the surface of the pad. If membrane 124 has a high density and a low permeability, it will retard the dispensing of the fragrance to the atmosphere. If membrane 124 has a low density and high permeability, then the fragrance will be released more rapidly.

Also, the specific type of fragrance agent and its physical properties contribute to the desired release rate. Generally, the active odor-producing ingredient is an organic oil-base perfume. Depending on cost and scent strength, it may be appropriate to mix the perfume with an odorless extender. A suitable extender for purposes of the present invention when aromatic organic oil-based perfumes are used, is Isopar®, an odorless mineral oil, previously discussed.

According to the present invention, the properties of pad 122 are selected in combination with the properties of membrane 124 to achieve a desired, predetermined rate of fragrance release and cartridge life. Generally, a service life of at least about twenty days is easily achieved by the present invention. As mentioned earlier, prior art cartridges have employed light pads with light membranes, resulting in rapid depletion of the fragrance in the cartridge. The cartridges of the present invention provide a longer service life of satisfactory release rates for the fragrances. In particular, the life of preferred cartridges 120 of the present invention is about 28-30 days. Prior art devices, by contrast, provide a much lesser service life, which is on the order of one to two weeks with some lasting only 3-4 days. The present invention therefore constitutes an almost tenfold improvement over the prior art.

One particularly preferred embodiment of the present invention employs a pad 122 having a density of about 128 oz/yd^2 and a denier of about 6. This is considered a high density pad for purposes of the invention. Suitable materials for the pad of the present invention can be obtained from The Felters Company, located in Middlebury, Massachusetts, U.S.A.

To counter the restrictive flow characteristics of the high density pad, a low density, high permeability membrane 124 is used. A suitable membrane material is REEMAY® Style 2033, which has a density of about 2.95 oz/yd^2, a permeability of about 250 CFM/ft^2 and a denier of about 4.4.

Alternatively, a higher permeability membrane could be used, such as REEMAY® Style 2295. Its density and denier are the same as the Style 2033, but the permeability is about 300 CFM/ft$_2$. The combination of a flow-restrictive pad and flow-permissive membrane produces the balanced properties of long life and sufficient fragrance release.

If a longer fragrance release life were desired and a highly restricted rate of dispensation of the fragrance were acceptable, then a heavier density, lower porosity membrane could be used in combination with the high density pad. REEMAY® Style 2470 is such a lower porosity material, having a density of about 6 oz/yd^2, a permeability of about 150 CFM/ft^2, and a denier of about 4.4.

The more preferable, balanced characteristics of the previous embodiments can alternatively be achieved in accordance with another preferred embodiment of the invention, which employs a low density pad 122 in combination with a high density, low permeability membrane 124. Thus a pad having a density of 72 oz/yd^2 and a denier of about 3, which would dispense its store of aromatic agent relatively rapidly if exposed to open air, can be satisfactorily used. A suitable membrane for balancing the rapid dispensing characteristics of the pad

is the REEMAY® Style 2470. As stated above, this material has a density of about 6 oz/yd^2, a permeability of 150 CFM/ft^2 and a denier of about 4.4. This embodiment, like the embodiment using a high density pad with a low density membrane, can provide satisfactory performance for about 30 days.

HOT- AND COLD-TYPE GELS FOR INSERTION INTO CARTRIDGE HOUSING

Referring to FIGURE 11, in another preferred embodiment cartridge 220 contains hot-type gel 222 disposed in reservoir 223 having an open top. Preferably, hot-type gel 222 comprises at least about fifty percent fragrant agent, at least about fifteen percent gelling agent, at least about three percent encapsulant and, if necessary, a solvent therefor, to achieve a service life of about twenty-five to about thirty days (when used with a suitable membrane as discussed below). Most preferably, hot-type gel 222 comprises about 65%-85% fragrant agent, 20%-30% gelling agent, 2-7% encapsulant and, if necessary, a solvent therefore.

Cold-type gel 322 is housed in reservoir 323, having an open top, of cartridge 320. See FIGURE 12. Cold-type get 322 comprises at least about seventy percent fragrant agent, about at least five percent gelling agent and, if necessary, a solvent therefor, to achieve a service-life of about twenty-five to about thirty days (when used with a suitable membrane, as discussed below). Most preferably, cold-type gel 322 comprises at least about 80-95% fragrant agent, 5-15% gelling agent and a solvent therefor, if necessary.

The composition of gel 222, 322 (FIGURES 11, 12) is one factor which determines the release rate of the fragrance from the gel. For example, the amount of each ingredient can be varied to provide a different release rate. To obtain a stronger odor for a shorter period of time, more fragrant agent can be used; conversely, less fragrance agent can be used to obtain a milder odor. To

obtain a milder odor for a longer period of time, more gelling agent can be used.

Gel 222, 322 is sealed within cartridge housing 226, 326 by membrane 224, 324 attached to shoulder 228, 328, respectively. See FIGURES 11, 12. Attachment of membrane 224, 324 to shoulder 228, 328, can be accomplished in any manner which forms an air tight seal around shoulder 228, 328, respectively. One method of attachment includes ultrasonic welding. After membrane 224, 324 is attached to shoulder 228, 328, membrane 224, 324 covers housing opening, such as 230, but preferably does not contact gel 222, 322, respectively.

The properties of membrane 224, 324 affect the rate of dispersal of the fragrant agent by delimiting the flow of the fragrant agent. If membrane 224, 324 has a high density and a low permeability, it will retard the dispensing of the fragrance to the atmosphere. If membrane 224, 324 has a low density and a high permeability, then the fragrance will be released more rapidly.

Any membrane 224, 324 (FIGURES 11, 12) can be used which permits the fragrant agent to communicate with an environment external to the cartridge housing opening, such as 230. Preferably, membrane 224, 324 sufficiently screens the flow of fragrant agent such that the service life of cartridge 220, 320 is approximately twenty-five to thirty days.

One membrane 224 which achieves about a thirty-day release rate for the hot-type gel 222 is REEMAY® Style 2006, manufactured by Intertech Group, Inc. of Old Hickory, Tennessee.

Seal 232, 332 is secured across opening, such as 230, of housing 226, 326 and, in particular, is joined to lip 234, 334 (FIGS. 11, 12) for preventing release of the fragrance between the time of manufacture and the time of use. Lip 234, 334 allows seal 232, 332 to be bonded thereto in a position away from upper

surface, such as 336, of gel 222, 322 thereby affording a dry surface for providing a secure, airtight seal.

Seal 232, 332 can be made of any material which prevents the release of the fragrant agent, but is most preferably made of foil, and is securely bonded to lip 234, 334 by heat and pressure bonding. Alternatively, ultrasonic welding or an adhesive may be used to make this bond.

Seal 232, 332 includes tab, such as 238 (FIGURE 11), which can be gripped by a user to remove the seal to open the cartridge 220, 320 for dispersal of the fragrance.

CARTRIDGE HAVING ATTACHED BATTERY COMPARTMENT

Referring to FIGURE 11, cartridge 220 has attached battery compartment 240 for containing battery 18. Battery compartment 240 can be made of any material, but most preferably comprises a plastic.

Battery compartment 240 has opening 242, which is adapted in size and shape to receive and hold battery 18. FIGURE 12 shows battery 18 disposed inside battery compartment 240.

Battery compartment 240 is connected to the gel or pad-containing reservoir by any suitable connector. In the preferred embodiment, lip 234 is extended and attached to battery compartment 240.

IN OPERATION

Referring to FIGURES 1, 12, in operation, battery 18 is operably connected to fan 16. Battery 18 may, if desired, be housed in battery compartment

240, shown in FIGURES 11, 12. Again referring to FIGURES 1, 12, cartridge 20 containing a vaporizable fragrance is placed on ribs 63a, 63b of upper surface 64 of bottom panel 26 below fan 16 after removing seal from cartridge 20. Front panel 30 of housing 12 is then closed by securely latching tab 36 of latch 38 into notch 40. See FIGURES 1, 2, 2A, 4.

When fan 16 is operational, fan 16 draws air into housing 12 substantially through lower inlet vents 14d, 14e, 14d', 14e'. Fan 16 pulls air at least partially across cartridge 20 causing the oil or gel to be vaporized, pulls the air upward through housing 12 and into fan 16, and directs the air radially outward substantially through the uppermost outlet vents 14a, 14b, 14c, 14a', 14b', 14c'. As such, air flow movement is generally confined within middle chamber 69 and upper chamber 77.

When air is drawn into inlet vents 14d, 14e, 14d', 14e', shelf 67a generally prevents air from flowing into lower compartment 71. Upper ribs 75a, 75b generally cooperate with fan housing 46 to prevent, or at least interfere with, air flow into upper chamber 77, except through fan 16.

Because centrifugal fan 16 pulls air upward and across cartridge 20, the fragrance contained in cartridge 20 is not vaporized as quickly as compared to a fan (not shown) which blows air directly down and onto cartridge 20. Because fan 16 pulls air upward from cartridge 20, rather than directly down onto cartridge 20 as shown in the prior art, the cartridge 20 and fan 16 can be placed in closer proximity to each other, thus reducing the overall size of dispenser 10.

Because both battery 18 and cartridge 20 have a useful life of approximately the same length of time, which is approximately thirty days, it is oftentimes desirable to replace them simultaneously, which replacement is facilitated by use of cartridge 220 having battery compartment 240. Because front panel 30

(FIGURES 2-5) of housing 12 is hinged, battery 18 and cartridge 20 can be easily replaced without removing dispenser 10 from a supporting wall.

When cartridges 220, 320 (FIGURES 11, 12) are placed in dispenser 10 (FIGURE 1), movement of air across cartridge 220, 320 causes fragrant agent in gel 222, 322 to rise to the upper surface, such as 336, of gel 222. The rate at which the aromatic agent is drawn to the top surface 336 of gel 320 and released into the environment external to cartridge housing opening depends on the properties of the gel. These properties include, but are not limited to, the type of fragrant agent used and the permeability of the membrane. The average daily release rate for gels 222, 322, when used in conjunction with membrane 224, 324 is about 0.70 - 1.3 grams per day.

According to the present invention, the properties of gel 222, 322 in combination with the properties of membrane 224, 324 achieve a desired, predetermined rate of fragrance release and cartridge life. Generally, a service life of at least about twenty-five days is easily achieved by the present invention. In fact, in most instances, the service life is about twenty-five to thirty days.

Further, it should be noted that cartridges 220, 320 provide a plurality of variables which can affect the release rate and, hence, the cartridge life. For example, a gel with a relatively high concentration ofgelling agent will have a relatively longer odor-dispensing life than a gel with a lesser concentration of gelling agent (all other things being equal, such as the properties of the membrane 224, 324).

Alternatively, the gel composition may remain the same, while the density of membrane 224, 324 can be varied to provide a cartridge 220, 320 with a longer or shorter dispensing life, as desired. For example, a membrane with a higher density will retard the flow of the fragrant agent more than a membrane

with a lower density. In addition, other membrane properties can be varied. A membrane with a lower permeability will retard the flow of the fragrant agent, while a membrane with a higher permeability will increase the flow of the fragrant agent. Further, the denier can be varied to achieve a desired release rate.

It should be understood by those skilled in the art that obvious modifications can be made without departing from the spirit of the invention. Accordingly, reference should be made primarily to the accompanying claims, rather than the foregoing specification, to determine the scope of the invention.

We claim:

1. A dispenser for a vaporizable substance, comprising:

a housing having a first end and a second end;

at least one inlet vent extending about the first end of the housing, the inlet vent having a top and a bottom;

at least one outlet vent extending about the first end of the housing, the outlet vent being positioned above the inlet vent;

a cartridge having a housing and a reservoir disposed inside the housing, the reservoir having an opening for containing a vaporizable substance, the cartridge having a rim, the rim of the cartridge being positioned no higher than the bottom of the inlet vent; and

a fan for creating a flow of air within the dispenser housing between the inlet vent and the outlet vent such that the air flows in the inlet vent, passes at least partially across the vaporizable substance, and flows radially out the outlet vent.

2. The dispenser for a vaporizable substance of Claim 1, wherein the fan comprises a centrifugal fan.

3. The dispenser for a vaporizable substance of Claim 1, the dispenser housing further comprising a wall having an inner surface and at least one shelf adjacent the rim of the cartridge and projecting from the inner surface of the wall, the shelf substantially defining a boundary between a middle and a lower compartment, the shelf and rim cooperating to substantially prevent the flow of air into the lower compartment.

4. The dispenser for a vaporizable substance of Claim 3, the fan further comprising a housing, the dispenser housing further comprising at least one upper rib adjacent the fan housing, the rib projecting from the inner surface of

the wall of the housing and substantially defining a boundary between an upper compartment and the middle compartment.

5. The dispenser for a vaporizable substance of Claim 4, the dispenser housing further comprising a plurality of ribs.

6. The dispenser for a vaporizable substance of Claim 4, the cartridge having an uppermost portion, the fan housing having an uppermost portion, the vents having a lowermost and an uppermost portion. the lowermost portion of the vents located substantially adjacent to the uppermost portion of the cartridge, and the uppermost portion of the vents located substantially adjacent to the uppermost portion of the fan.

7. The dispenser for a vaporizable substance of Claim 1, the dispenser housing further comprising a wall between the two ends, a battery for energizing the fan, the battery being located on one side of the wall and the cartridge and fan being located on the opposite side of the wall.

8. The dispenser for a vaporizable substance of Claim 1. wherein the vents extend approximately one hundred ninety degrees to two hundred thirty degrees about the dispenser housing.

9. The dispenser for a vaporizable substance of Claim 1, wherein the cartridge comprises:

a pad member disposed in the reservoir of the cartridge, having an upper surface and having a density of between about 50 and about 150 oz/yd^2;

a fragrance agent initially retained substantially within the pad member; and

a permeable membrane having a density of between about 1.5 oz/yd^2 and about 9 oz/yd^2 and an air permeability of between about 100 CFM/ft^2 and 400

CFM/ft^2, the membrane covering at least the reservoir opening for retaining the pad member within the cartridge housing and positioned adjacent the pad member to allow the fragrance agent to be drawn through the pad member to the upper surface thereof to saturate the membrane, thus permitting the fragrance agent to communicate with
an environment external to the housing opening through the membrane at a release rate of about 0.55 to about 0.9 grams per day.

10. The dispenser for a vaporizable substance of Claim 9, wherein the density and denier of the pad member and the density, denier and permeability of the membrane are selected to provide an expected life for the fragrance agent of about 30 days at the stated release rate.

11. The dispenser for a vaporizable substance of Claim 1, wherein the cartridge comprises:

a gel disposed in the reservoir of the cartridge, the gel having a fragrance agent. the gel having an upper surface; and

a permeable membrane, covering the opening of the reservoir, having an air permeability of about 800 CFM/ft^2 to about 1200 CFM/ft^2 and a density between about 0.3 oz/yd^2 and 0.9 oz/yd^2, the membrane, for delimiting the flow of fragrance agent. being positioned above the gel so as to permit the fragrance agent to communicate with an environment external to the reservoir opening through the membrane at a release rate between about 0.70 grams per day to about 1.30 grams per day.

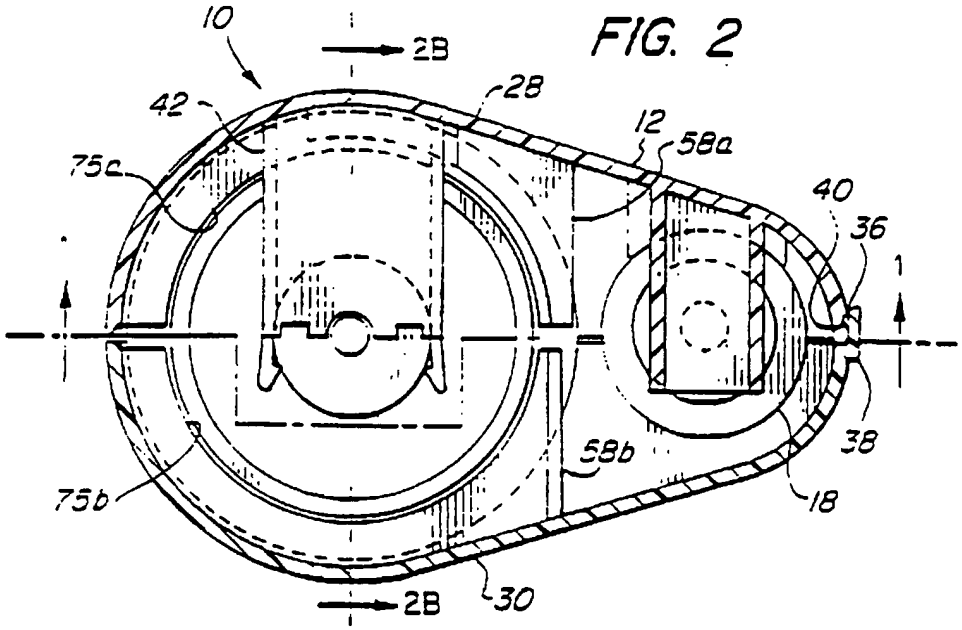
12. The dispenser for a vaporizable substance of Claim 11, wherein the membrane has a density between about 0.5 oz/yd^2 to about 0.7 oz/yd^2, and a permeability between about 900 CFM/ft^2 to about 1100 CFM/ft^2, and the fragrance communicates with the environment at a release rate between about 0.90 grams per day and 1.10 grams per day over a period of about 25 days.

13. The dispenser for a vaporizable substance of Claim 12, wherein the density, denier and permeability of the membrane are selected to provide an expected life for the fragrance agent of about 25 days.

14. The dispenser of any of Claims 1-13, further comprising a seal for covering the opening of the cartridge reservoir.

15. The dispenser of Claim 1, wherein the cartridge further comprises an integral battery compartment for containing at least a portion of a battery.

FIG. 2


10
2B
42
28
12
58a
75c
40
36
1
38
58b
75b
18
30
2B

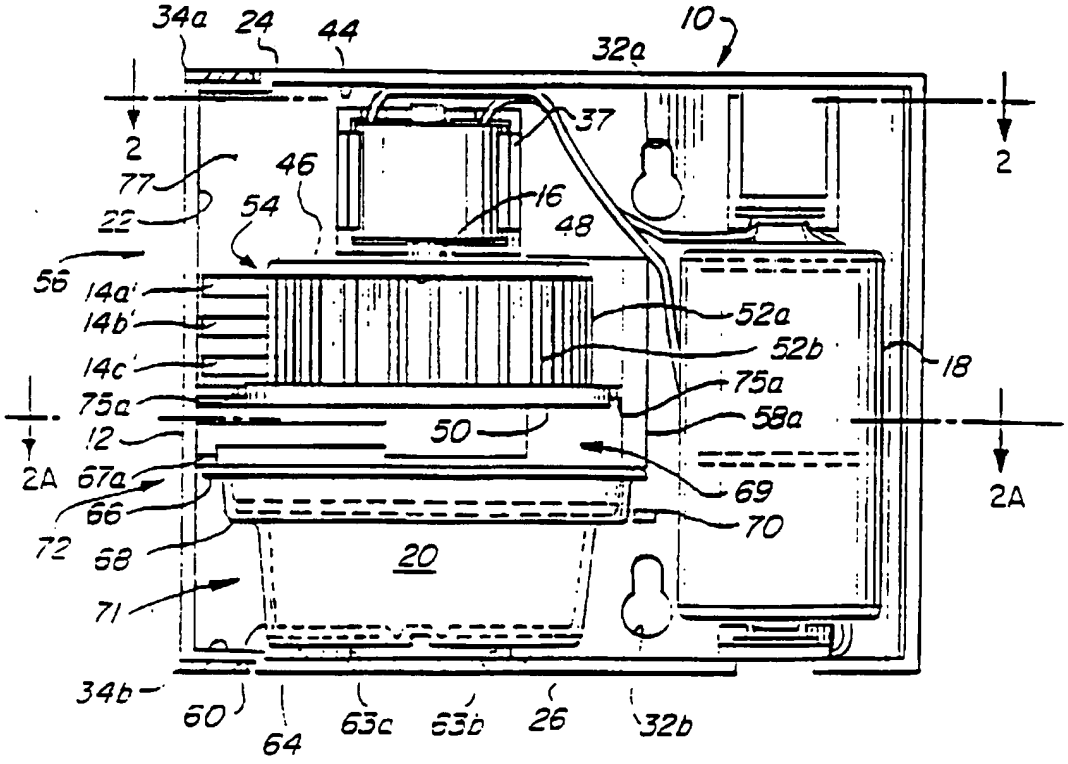

34a
24
44
10
32a
37
2
2
77
46
16
22
54
48
56
14a
14b
14c
52a
52b
18
75a
75a
58a
12
50
2A
67a
69
2A
66
70
72
68
20
71
34b
60
64
63c
63b
26
32b

FIG. 1

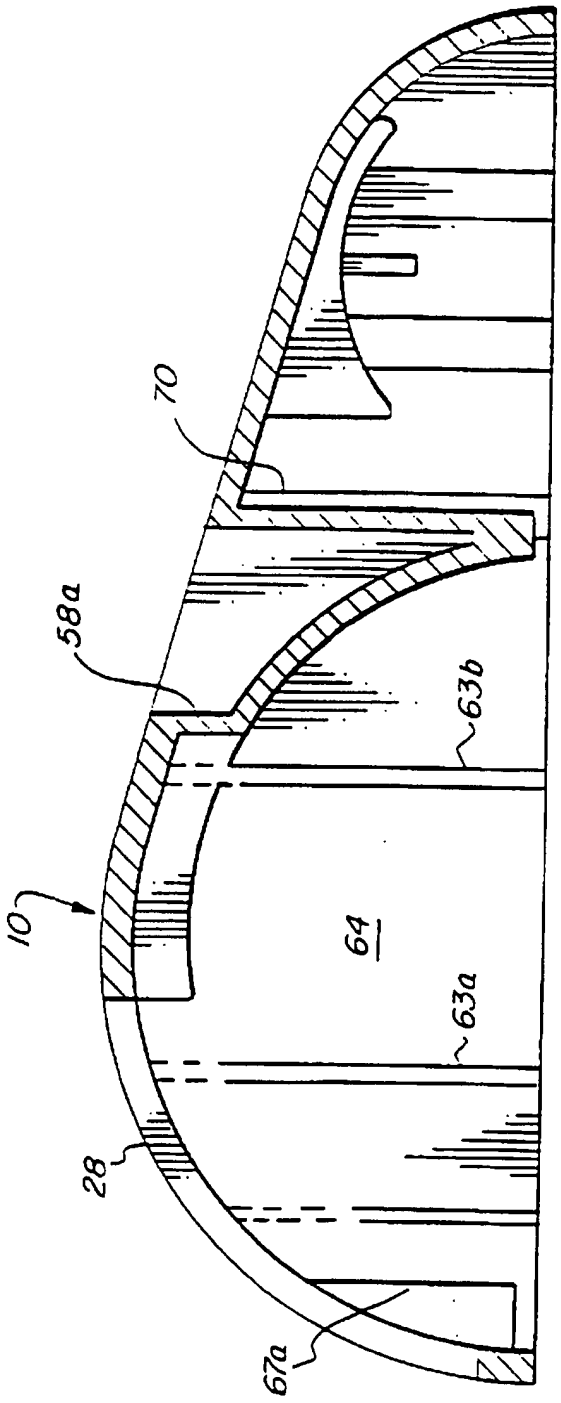


FIG. 2A

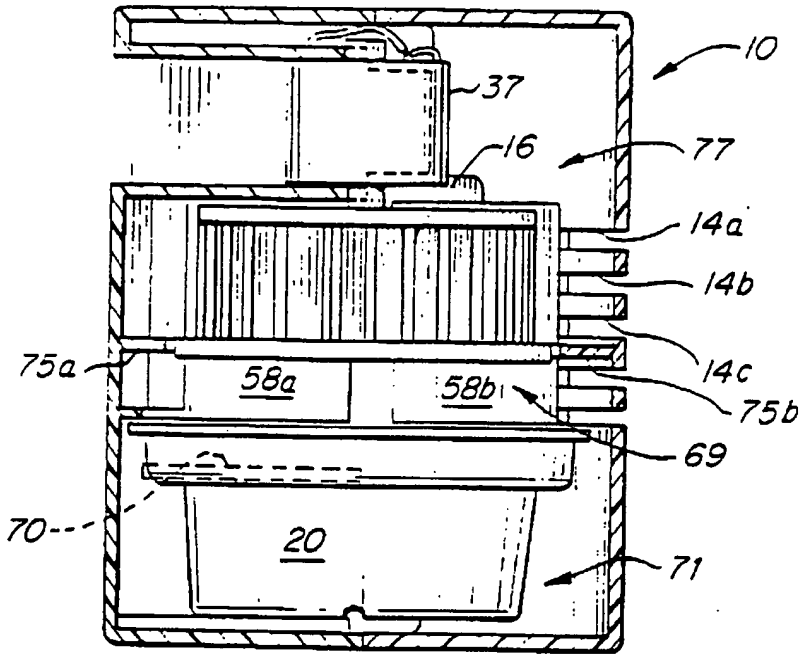
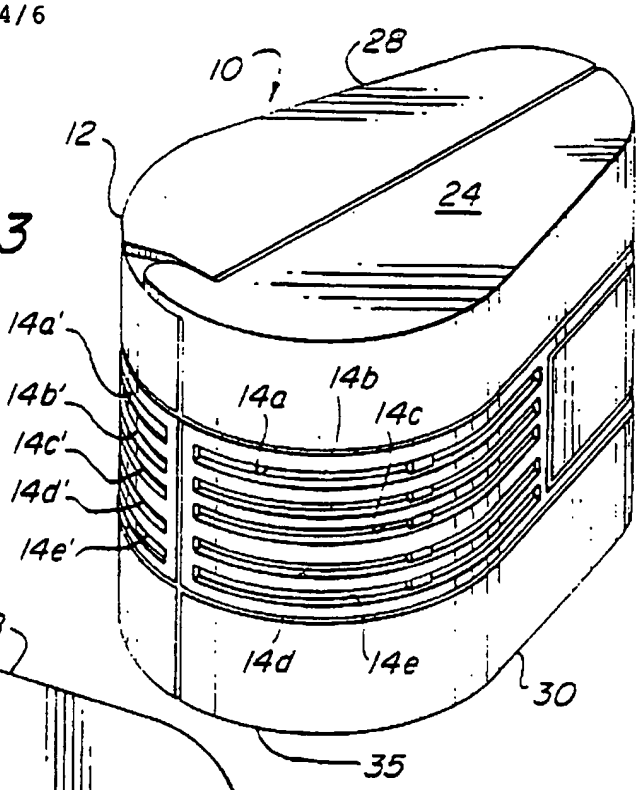


FIG. 2B

FIG. 3



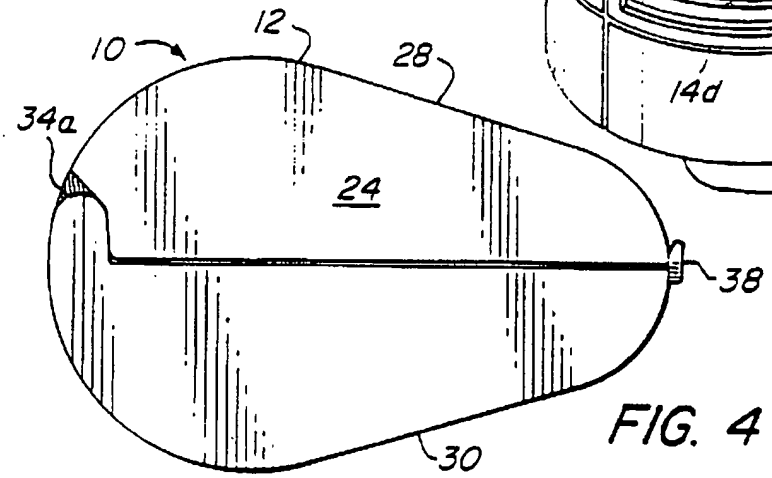


FIG. 4

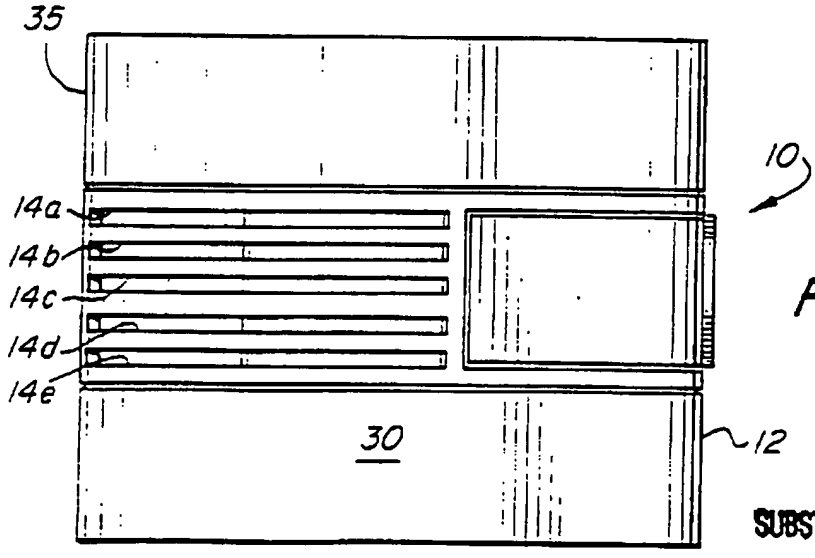


FIG. 5

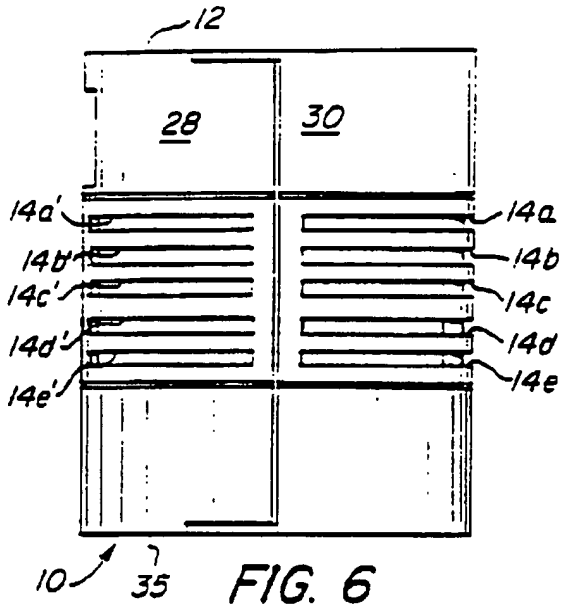


FIG. 6

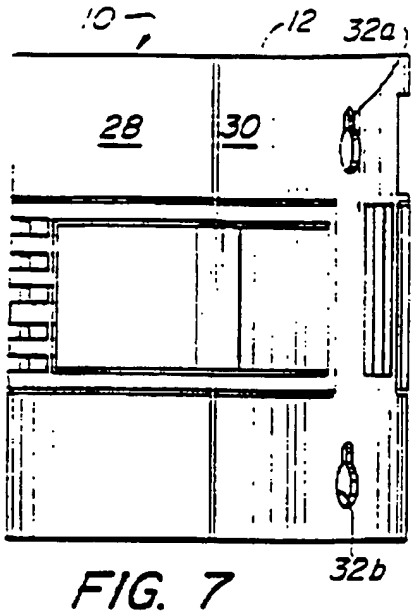


FIG. 7

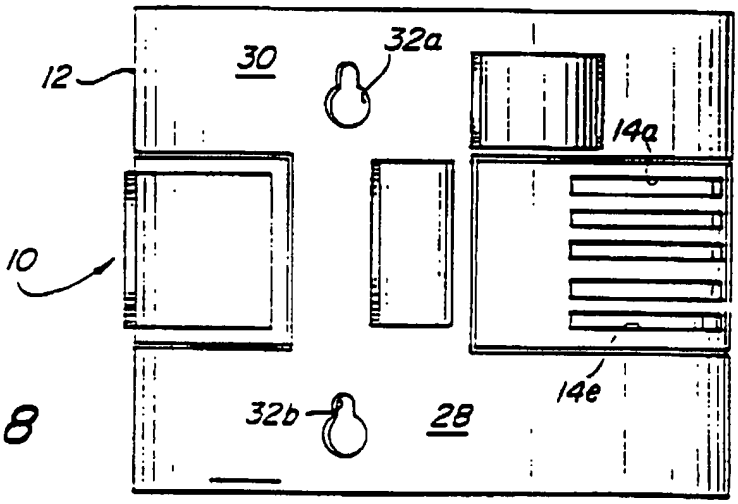


FIG. 8

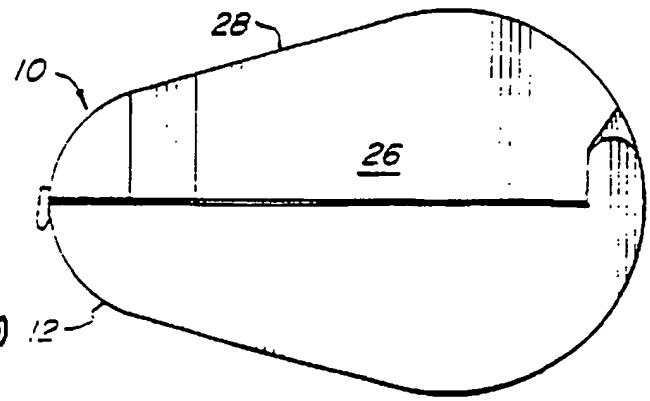


FIG. 9

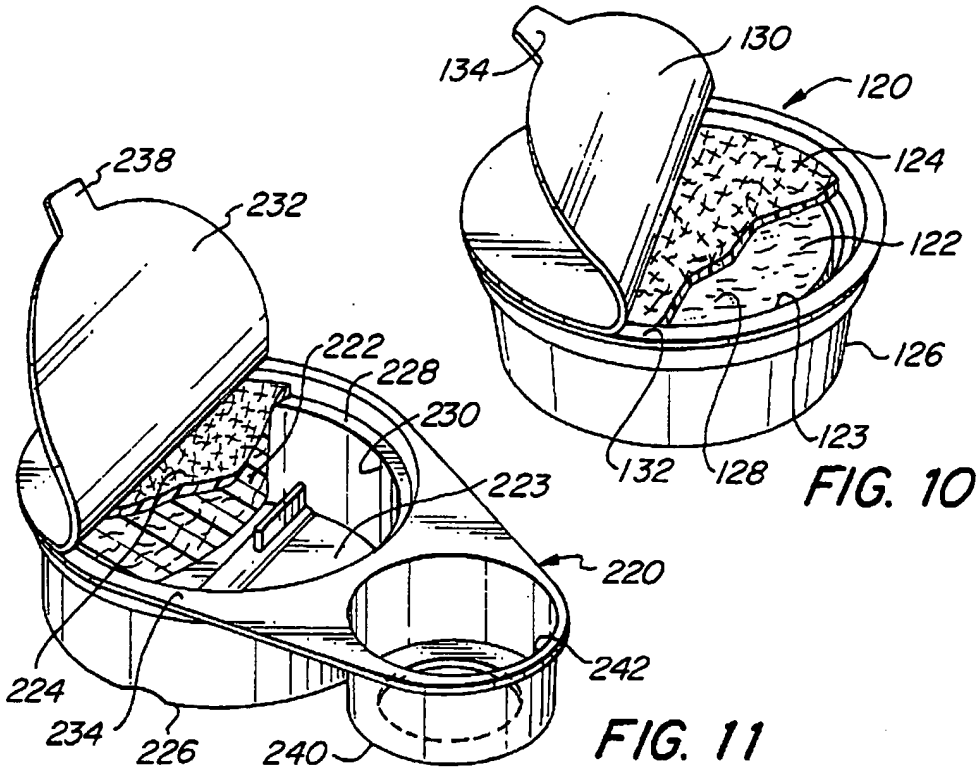


FIG. 10

FIG. 11

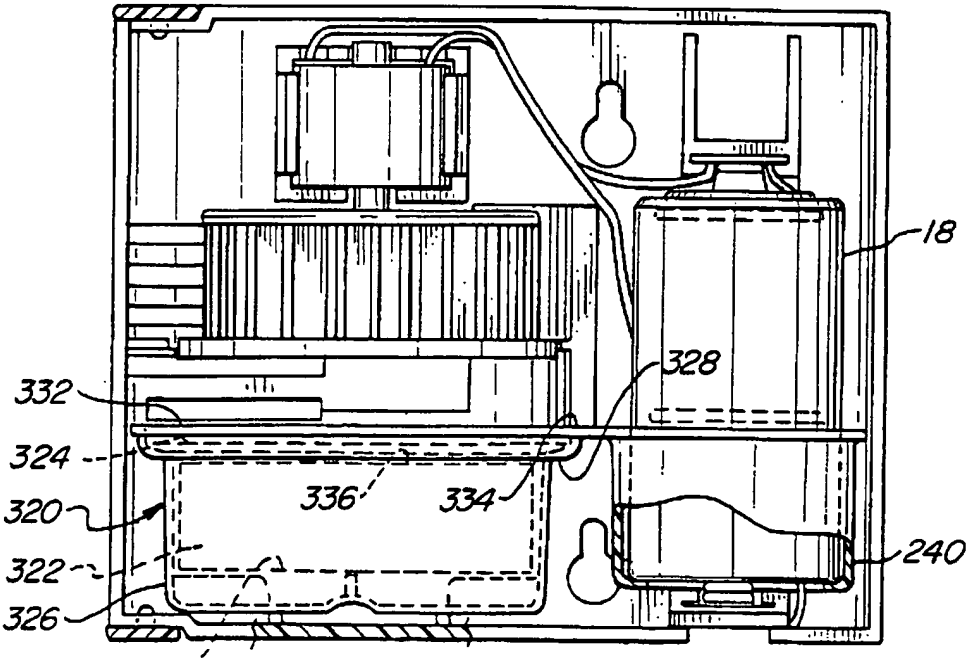


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/10043

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :B01F 3/04
US CL :261/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 261/24, 99, Digest 65. 422/124

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 2,629,149 (YAFFE) 24 FEBRUARY 1953, See Figure 1.	1-15
A	US, A, 3,908,905 (PHILIPP ET AL) 30 SEPTEMBER 1975, See Figure 1.	1-15
A	US, A, 3,990,848 (CORRIS) 09 NOVEMBER 1976, See Figure 1.	1-15
A	US, A, 3,993,444 (BROWN) 23 NOVEMBER 1976, See Figure 3.	1-15
A	US, A, 4,065,261 (FUKADA) 27 DECEMBER 1977, See Figure 5.	1-15
A	US, A, 4,166,087 (CLINE ET AL) 28 AUGUST 1979, See Figure 1.	1-15

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
07 DECEMBER 1994	15DEC 1994
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 308-3230	Authorized officer Debbie Thomas TIM R. MILES Telephone No. (703) 308-3790

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/10043

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,271,092 (SULLIVAN ET AL) 2 JUNE 1981, See Figure 2.	1-15
A	US, A, 4,370,300 (MORI ET AL) 25 JANUARY 1983, See Figure 7.	1-15
A	US, A, 4,666,636 (BAKER ET AL) 19 MAY 1987, See Figure 4.	1-15
A	US, A, 4,743,406 (STEINER ET AL) 10 MAY 1988, See Figure 3.	1-15
A	US, A, 4,830,791 (MUDERLAK ET AL) 16 MAY 1989, See Figure 7.	1-15
A	US, A, 4,840,770 (WALZ ET AL) 20 JUNE 1989, See Figure 4.	1-15
A	US, A, 4,865,816 (WALZ ET AL) 12 SEPTEMBER 1989, See Figure 4.	1-15
A	US, A, 4,931,258 (ZLOTNIK ET AL) 05 JUNE 1990, See Figure 1.	1-15
A	US, A, 5,147,582 (HOLZNER, SR. ET AL) 15 SEPTEMBER 1992, See Figure 1.	1-15
A	US, A, 5,230,867 (KUNZE ET AL) 27 JULY 1993, See Figure 5.	1-15
A	EP, A, 0,267,697 (MITSUBISHI) 18 MAY 1988, See Figure 1.	1-15